Lyα emission as a sensitive probe of feedback-regulated LyC escape from dwarf galaxies

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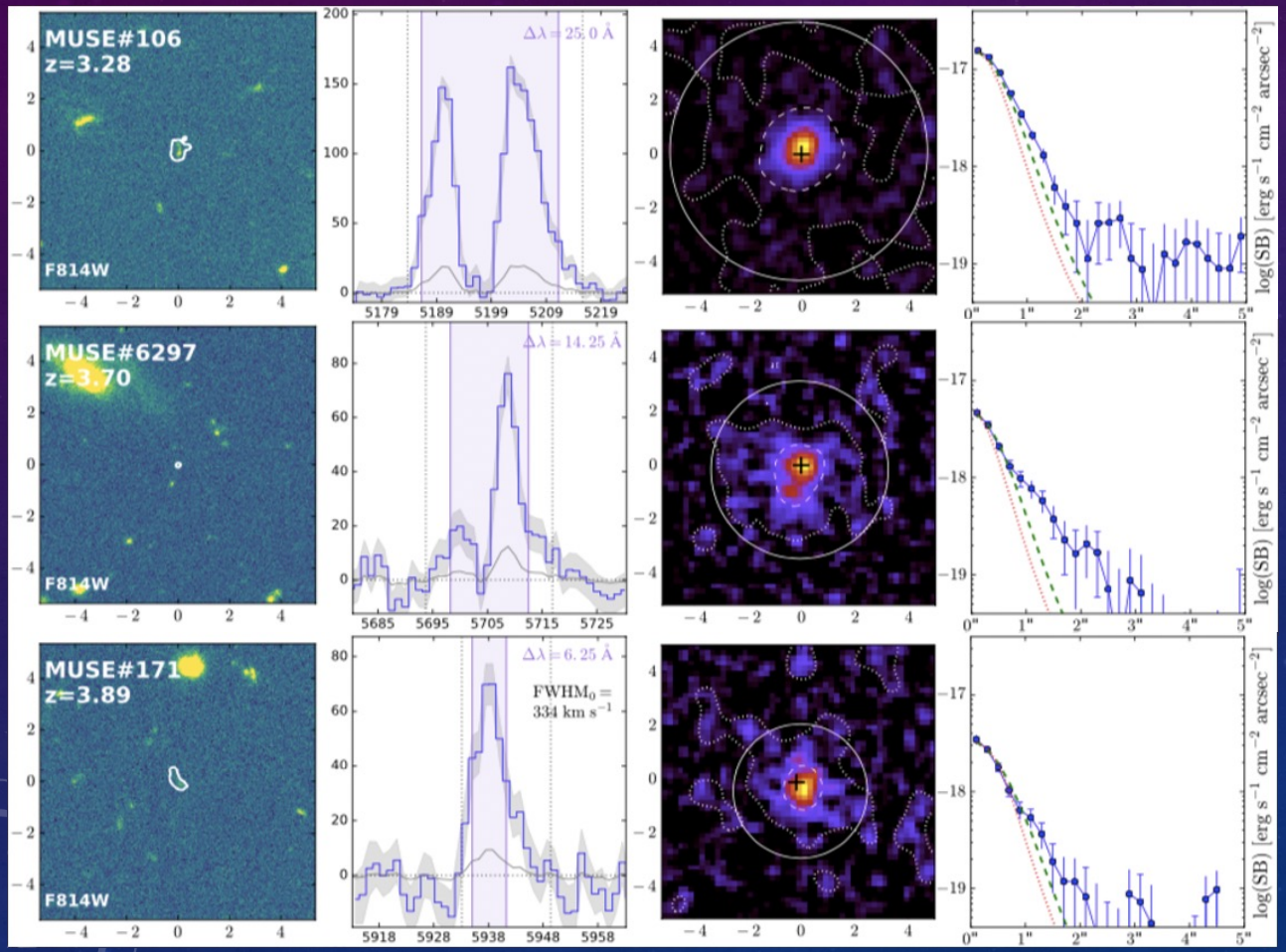
MUSE UDF SURVEY OF LYα HALO

UV images | Lyα spectra | Lyα images | SB profiles



- Lyα: tracer of star-forming galaxies
- Recombination emission
- Resonant scattering

- Lyα halo (LAH) is more extended than UV halo.
- Large variations of Lyα signature between objects.

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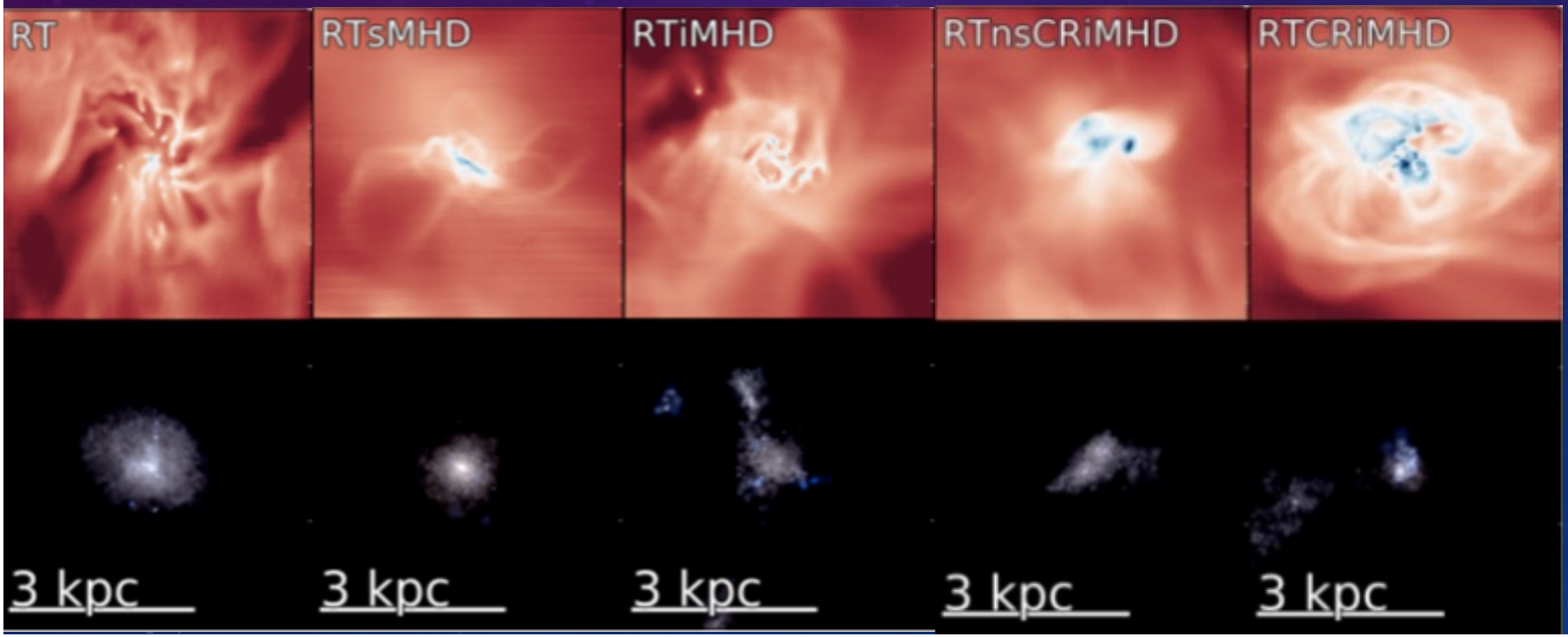
- Cosmological zoom-in simulation suite of dwarf galaxies
- RAMSES-RT
- Supernovae (SN) feedback, radiative transfer (RT); magneto-hydrodynamics (MHD); cosmic ray (CR)

RT RTsMHD RTiMHD RTnsCRiMHD RTCRiMHD



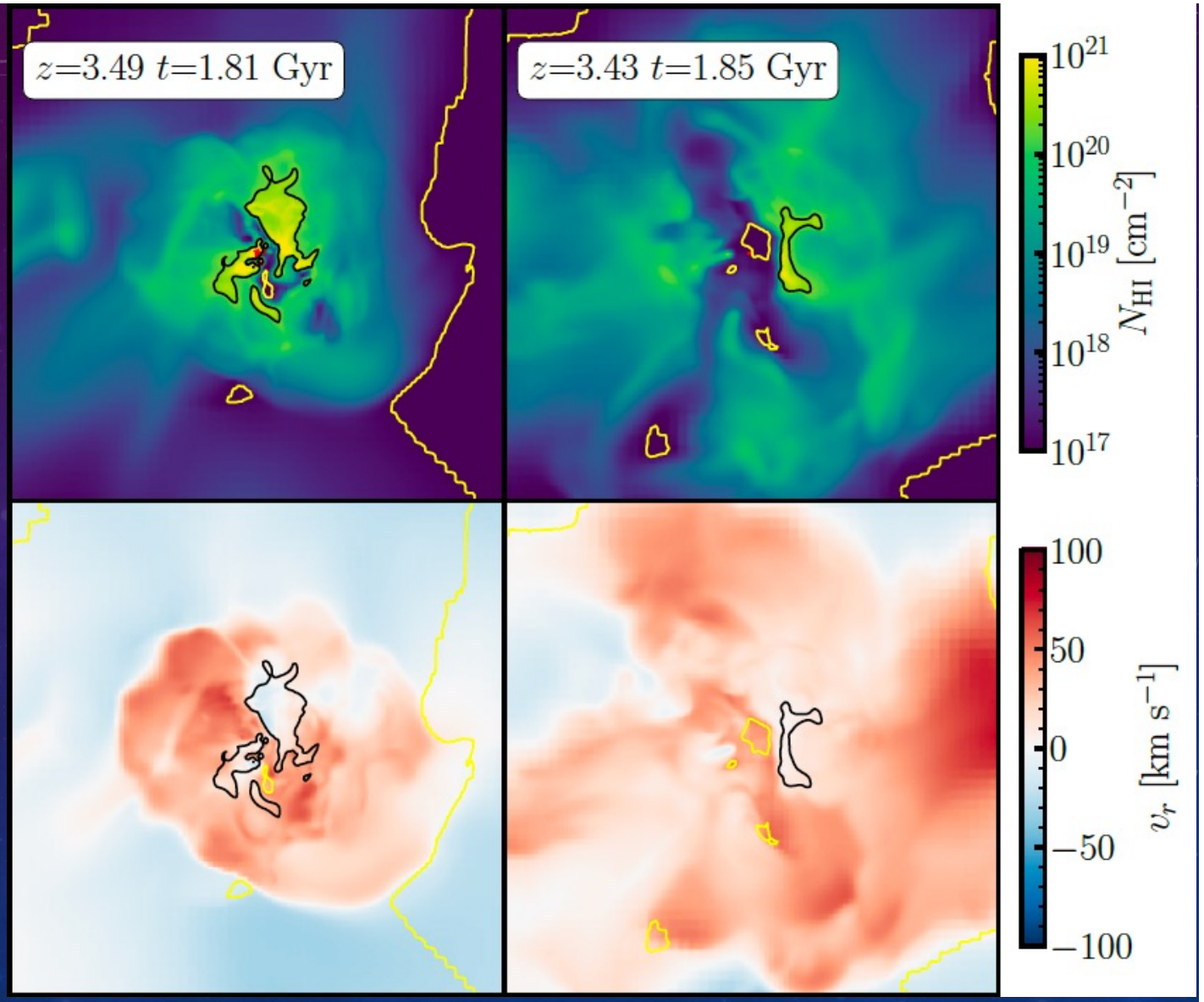
LYα POST-PROCESSING

- Postprocessing with **RASCAS** (http://rascas.univ-lyon1.fr/)
- Sample with 200,000 photon packets.
- Resonant scattering by HI.

- Photons
  - escape from the galaxy
  - get absorbed by dust
- Synthetic observations along 108 LOSs

GAS PROPERTIES

- RTCRiMHD simulation
- Expansion of outflow



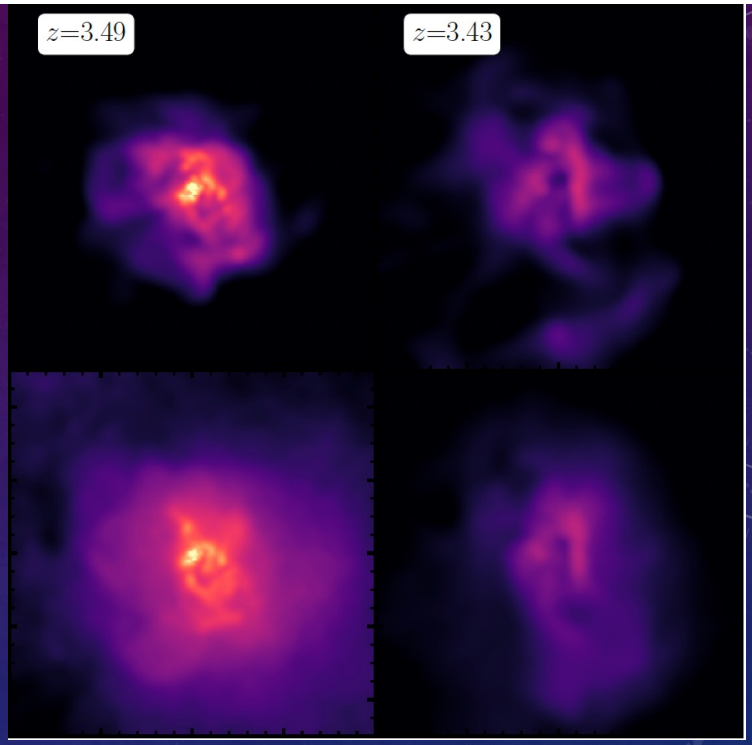
LYα IMAGES

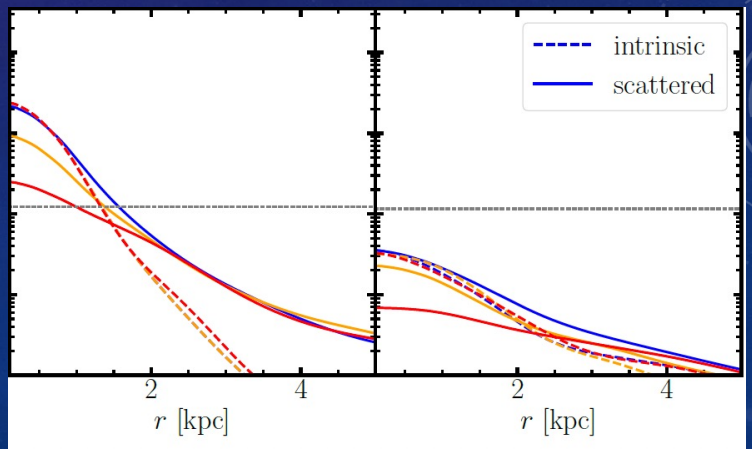
- Scattered Lyα images are more extended than intrinsic Lyα ones
- Along different LOS:
  - Similar intrinsic SB profile
  - Different scattered SB profile
- Weaker broadening effect when the wind is fully developed

Intrinsic Lyα

Scattered Lyα

SB

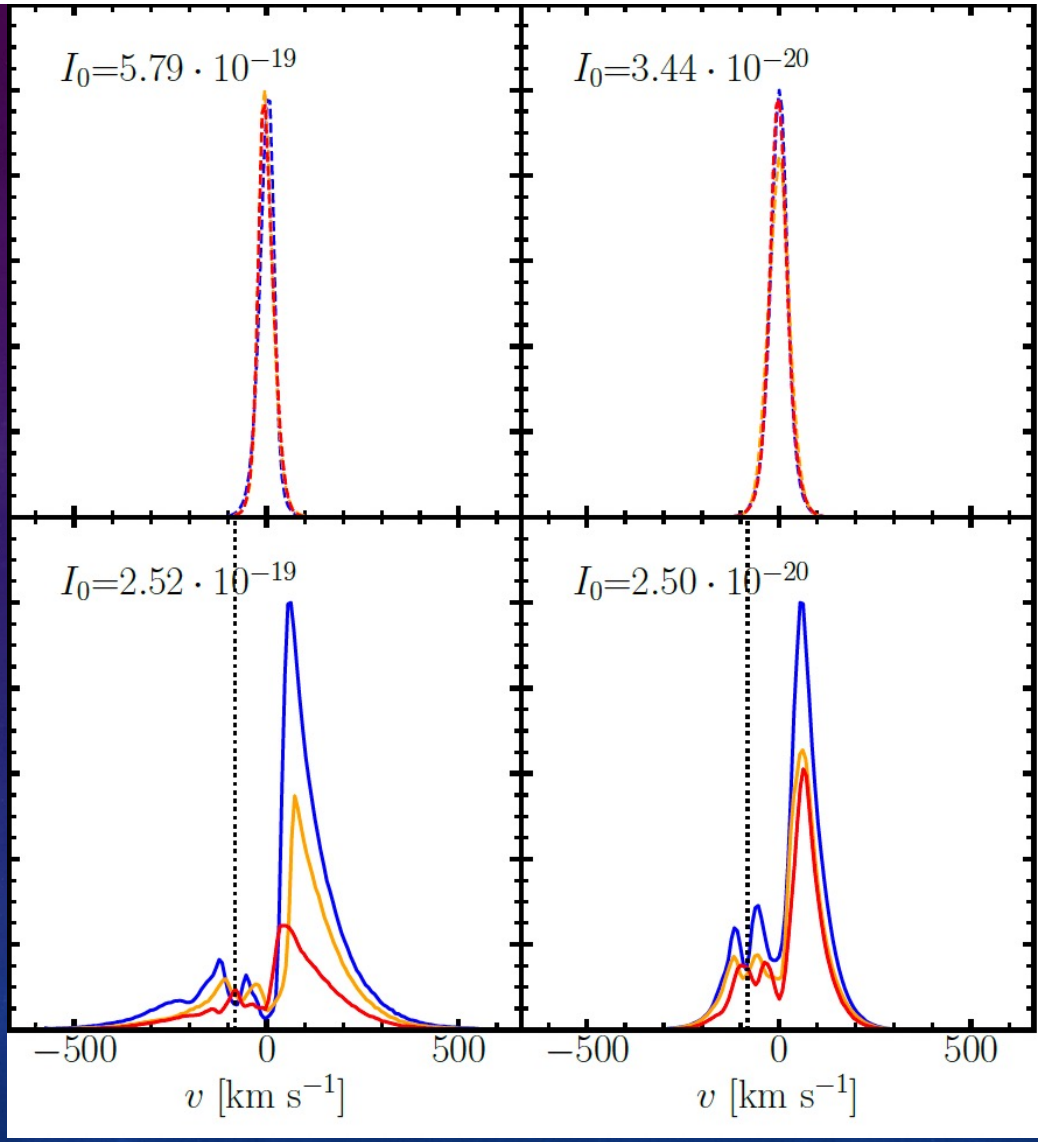




LYα SPECTRA

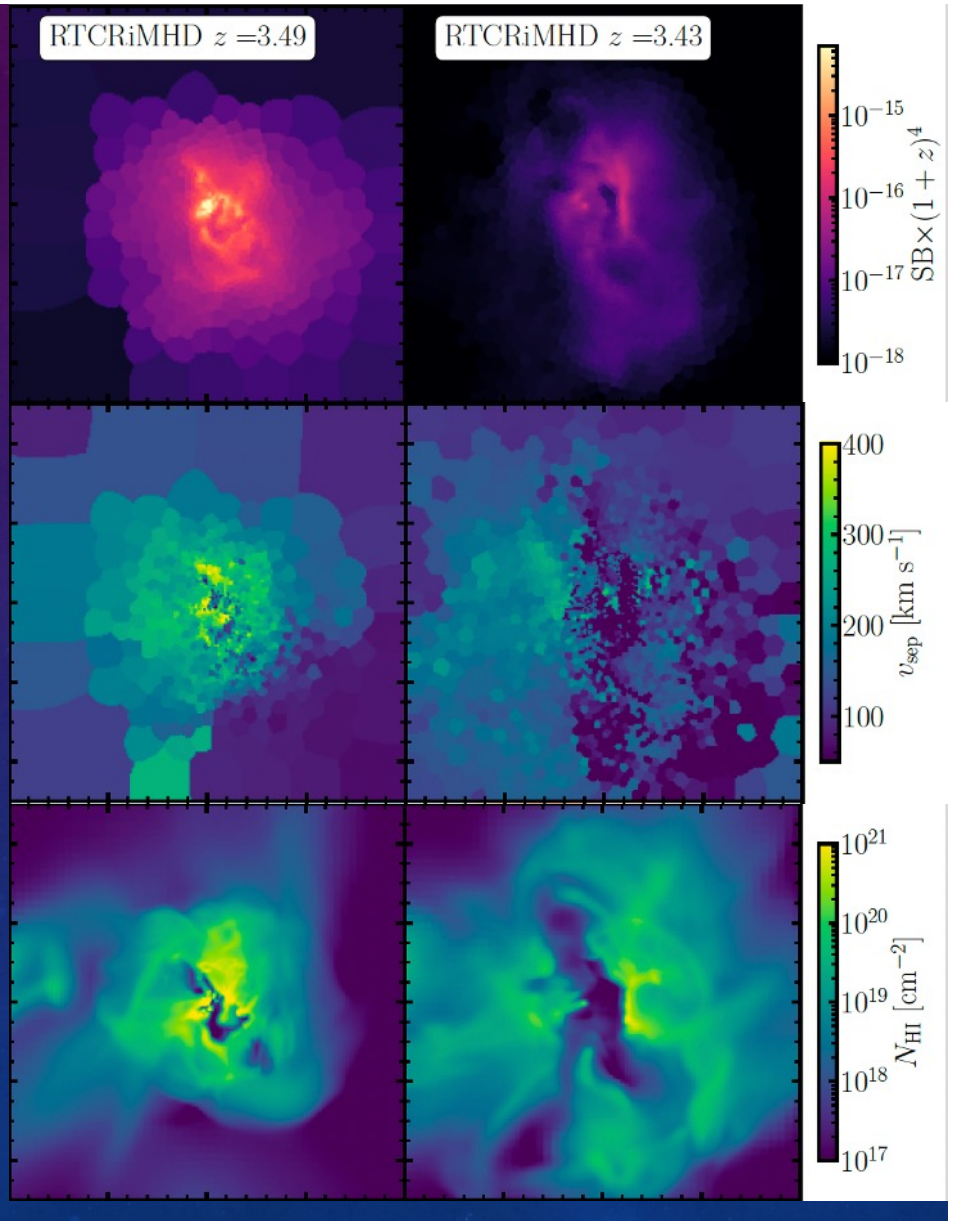
- Double (triple) peaked profile
- Prominent red peaks -> outflow

- v_{sep}: velocity separation between red and blue peaks
- R2B: size ratio of the red to blue peak



Inferring the gas distribution from Lyα

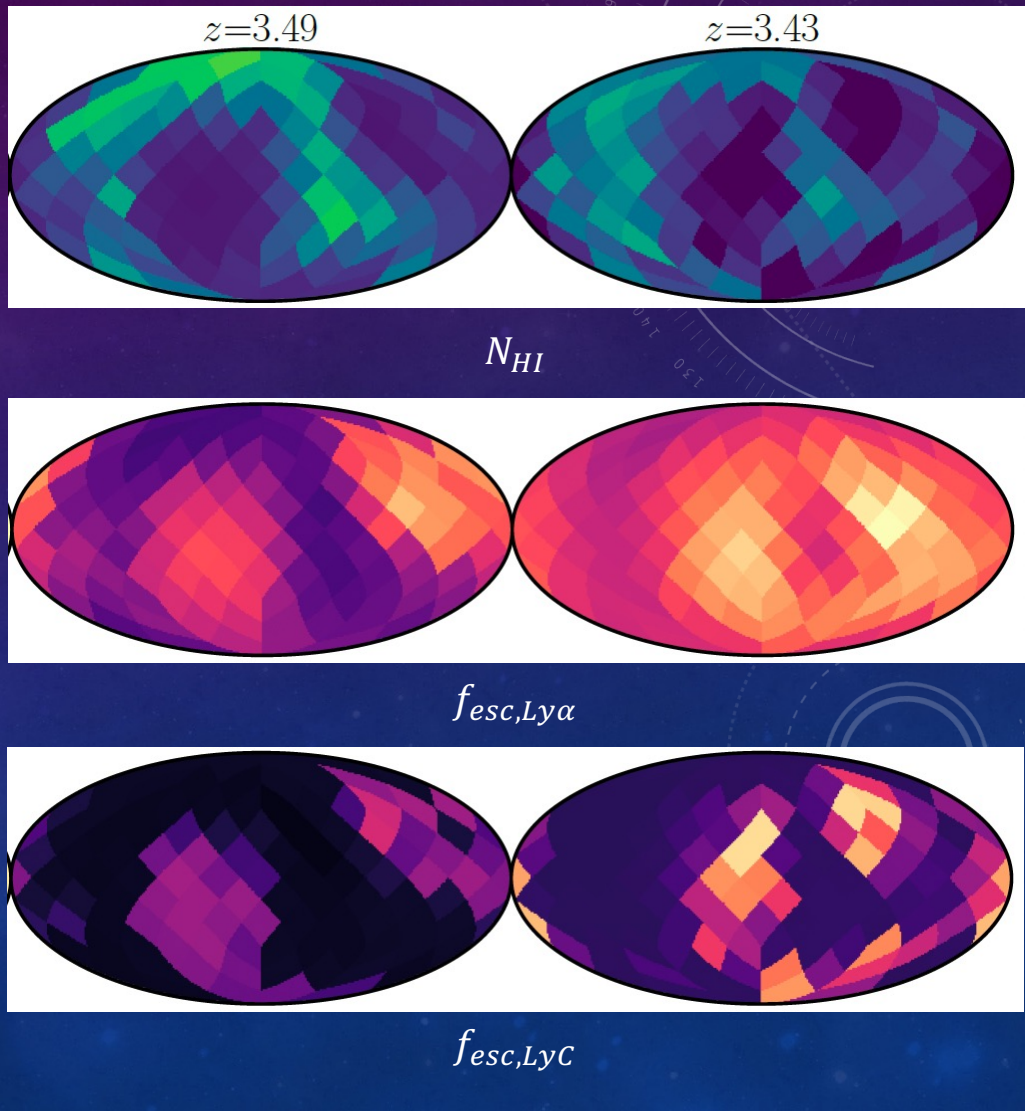
- Spatially resolved Lyα profile
- Voronoi tessellation
- Calculate SB, v_{sep} for the spectrum in each Voronoi bin
- v_{sep} -> N_{HI}



Anisotropic Lyα and LyC escape

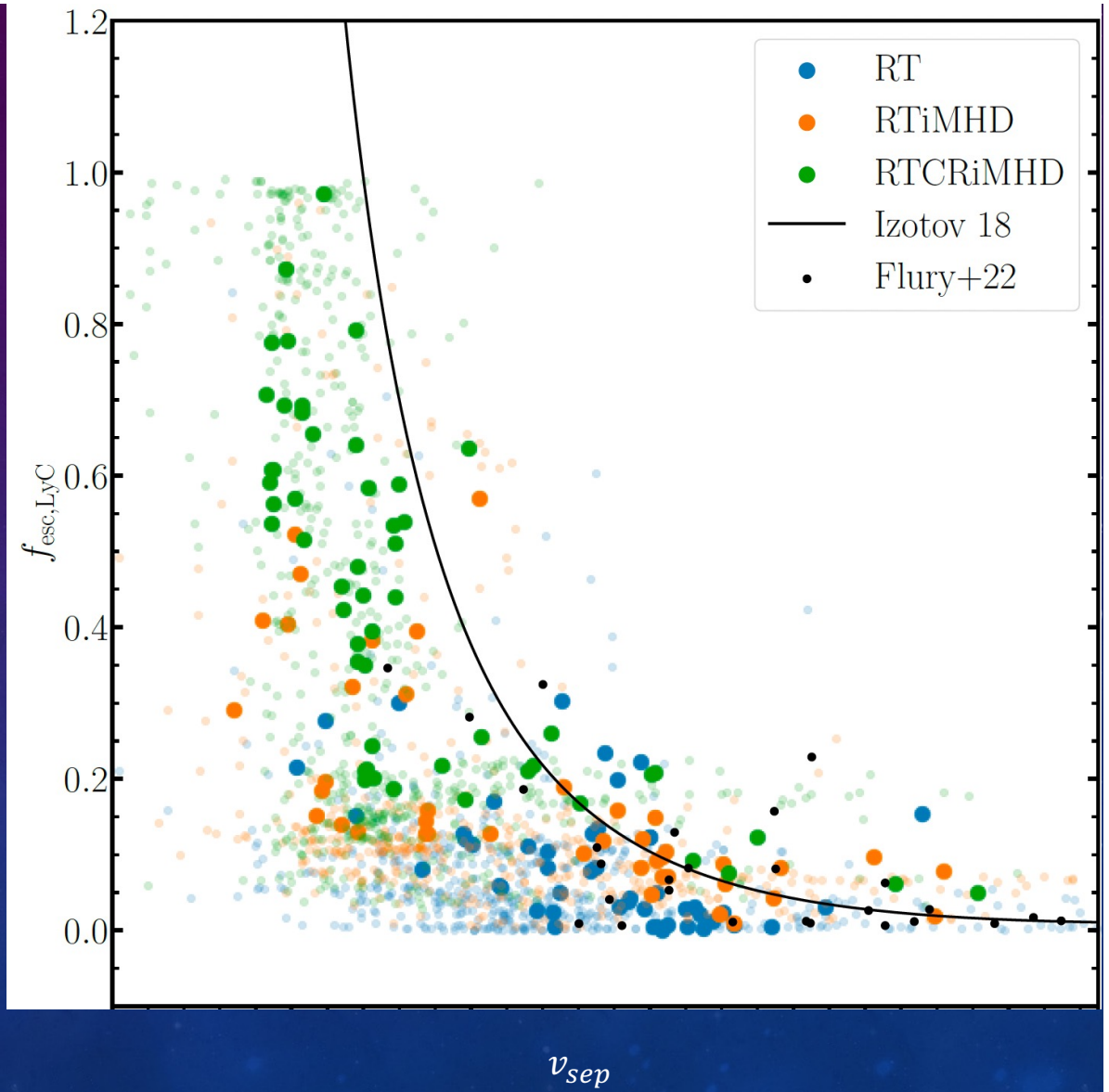
- Feedback -> low HI column density channel -> Lyα and LyC escape

- The distribution of $f_{esc,LyC}$ has a larger contrast compared to $f_{esc,Ly\alpha}$
- Different escape mechanisms



Decipher LyC escape with all physical models

- 3 simulations span an universal relation
- v_{sep} - $f_{esc,LyC}$: reproduce the Izotov18 relation.



Conclusions

- Dwarf undergoing starburst show extended Lyα emission and red-peak-dominated spectra.
- Spatially resolved Lyα opens a new window to investigate the neutral gas kinematics.
- Lyα and LyC escape differently and depends strongly on the LOS.
- Different simulation runs have diverse Lyα and LyC features, but they all follow universal relations on the parameter space.

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